

CALCULATING THE OREGON CITY FIRE DEPARTMENT'S RESPONSE TIMES

EXECUTIVE DEVELOPMENT

BY: Ken K. Dawson
Captain
Oregon City Fire Department
Oregon City, Oregon

An applied research project submitted to the National Fire Academy
As part of the Executive Fire Officer Program

January 1999

ABSTRACT

The problem that prompted this research project was that no in-depth study of the Department's response times had been completed. The Department's response time goals are well defined in the strategic plan, but no system is in place to determine if those goals are being met.

The purpose of this research was to determine if the department had been meeting its response time goals and if those goals are realistic when compared to what other organizations have done. The evaluative research method was used. The following research questions were posed:

1. How should Oregon City Fire Department calculate response times?
2. Is the Oregon City Fire Department meeting response time goals?
3. How do the Oregon City Fire Department's response time goals compare with those of other fire departments?

A literature review was conducted through the Learning Research Center at the National Emergency Training Center and the trade journal library of the Oregon City Fire Department. Several articles were located that addressed specific organizations' response times. Several methods for determining response times were located in other sources. Alarm data was collected from the Clackamas County Communications Department to determine the fire department's response times for 1998.

In 1998 the department responded to 73% of all emergency calls within 6 minutes, falling well short of the 90% goal. When compared with averages from the 1992 study completed by the International Association of Fire Chiefs the Oregon City statistics were slightly below average.

It was recommended that an annual review of response times be completed. The results of this research also indicated that the Oregon City Fire Department should calculate response time from the time a call is received until the first unit arrives. Regularly scheduled evaluations allow the department to measure the effect changes have had on response times, and identify steps to reduce dispatch, reflex, and travel segments of the total response time.

TABLE OF CONTENTS

	PAGE
Abstract.....	2
Table of Contents.....	4
Introduction.....	5
Background and Significance.....	5
Literature Review.....	7
Procedures.....	11
Results.....	13
Discussion.....	17
Recommendations.....	20
References.....	22

TABLES & FIGURES

Figure 1 – Number of Emergency Responses in One Minute Increments	14
Table 1 – Comparison of Oregon City Response Times with IAFC Study Results ...	16

INTRODUCTION

In 1997 the Oregon City Fire Department conducted an extensive strategic planning process. The Strategic Plan was the result of hours of hard work by citizens, community leaders, and fire department personnel. As a part of this process, response time goals for emergency medical calls and fire emergency calls were established.

As a result of those goals, the fire department began making some internal improvements to reduce response times. Those changes include building a third fire station, hiring additional personnel, and purchasing new apparatus.

The problem prompting this research surfaced during a review of the Strategic Plan in 1998. While response time goals were defined in the strategic plan, no research had been completed to determine if the department had met the goals.

The dual purpose of this research was to determine if the department met has response time goals and if the goals are realistic. The evaluative research method was used. The following research questions were posed:

1. How should Oregon City Fire Department calculate response times?
2. Is the Oregon City Fire Department meeting response time goals?
3. How do the Oregon City Fire Department's response time goals compare with those for other fire departments?

BACKGROUND AND SIGNIFICANCE

Oregon City is an historical center in the Pacific Northwest. It was the Territorial Capital and is the end of the Oregon Trail.

The City of Oregon City is located in Clackamas County in the State of Oregon. The population is currently approaching 24,000 and the City covers an area of approximately eight square miles. The population and area of the City has nearly doubled in the last ten years.

The Oregon City Fire Department is a division within the City of Oregon City. The Fire Chief reports to the City Manager, who in turn reports to the City Commission. In 1998, the Oregon City Fire Department operated 2 engine companies. The department maintains twenty uniformed members; eighteen firefighters, Deputy Fire Chief, and Fire Chief. Operational personnel were assigned to a three-platoon rotating schedule. Minimum shift staffing was six members per shift. With the growth Oregon City has experienced the demand for services continues to increase. In 1988 the Department answered 1,303 alarms. That number increased to 2,752 in 1998, an increase in calls for assistance of 111% over the last decade.

During the development of the Department's Strategic Plan citizens expressed their concerns over response times. As the City's area and population has expanded during the last decade, the Department's average response time has increased 32%.

Currently the department is using the response goals for long and short term planning. A number of projects have been undertaken recently in an attempt to improve response times. Establishing a consistent measure of response times will greatly aid the evaluation of the effectiveness of these projects.

This research will be critical for the department management team during future planning sessions. Station locations, equipment purchases, and personnel increases will be based on meeting the response time goals that have been established for the Department.

This research is relevant to the *Executive Development* course in that a significant portion of the course was dedicated to problem solving and research. The ultimate intent of this paper is

to provide information to the Department on how response times may be improved in the years to come.

LITERATURE REVIEW

The literature review identified several items relating to response times. The Oregon City Fire Department Strategic Plan states the response time goal as; “Provide a total response time of six minutes or less to 90% of the emergency responses in the urbanized areas of Oregon City” (Strategic Plan for the Oregon City Fire Department, 1997, p.45). The response goal for the department also states that responding units must be staffed with appropriate levels of manpower. “A prudent response pattern needs quick response times as well as a sufficient number of firefighters” (Coleman, 1988, p. 120).

Methods for Calculating Response Times

There are several different methods for calculating emergency response times. “A common definition of response time is the elapsed time from the moment a person makes a request for service until the first unit arrives on scene” (Brewster, 1994, p. 18). This is the most common method used for determining response times when they are to be used for department planning. By reducing the elapsed time into three key elements it is easier to identify areas for improvement.

- Alarm Processing Time – The period from when the call for assistance is answered until emergency responders are alerted.
- Reflex Time – The amount of time it takes emergency responders to cease whatever current task they are involved in and to begin to respond.
- Travel Time – The time for the apparatus to travel to the scene of the incident.

These three areas are directly affected by the policies, procedures, equipment, and

facility locations of an organization. Expressing response times into these three categories allows the service agency to measure and evaluate each segment independently and to plan for improvements accordingly. “When we talk about the emergency response timeline, we speak of the time involved in all three phases as a continuum; beginning with the moment the call is received and ending once help has been delivered” (Cole, 1991, p. 20).

Another method for calculating response times breaks the elapsed time into several different segments of the emergency response. In 1995, Paul defined response time as the “total elapsed time from when an incident happens until an appropriate responder starts corrective action” (Paul, 1995, p. 111).

In this system of measuring response times the total elapsed time is broken into seven separate segments.

- Discovery Time - The time from the occurrence until someone becomes aware of it.
- Notification Time - The time after discovery that elapses until a phone is located and a call for assistance is made.
- Comprehension Time - Time expended by the dispatcher in understanding the nature of the call and determining the proper course of action.
- Activation Time - The period it takes to notify responders of the emergency.
- Responder Preparation Time - Measures the length of time it takes emergency responders to prepare themselves for the incident.
- Travel Time - The length of time for the emergency unit to travel to the scene.
- Assessment and Action Time - The period between units arriving on scene and corrective action beginning.

This method of measuring takes into account several factors over which the emergency services provider has little control over (Paul, 1995, p. 111). Factors outside the control of the organization should be identified but provide little value during long and short term planning.

In the past, the Oregon City Fire Department has measured response times as the elapsed time from when a unit was notified until it arrived on scene (C. Poulton, personal communication, November 13, 1998). Response times calculated in this manner do not include the period of time from the call for assistance to the emergency responder's notification.

Calculating response times based on the elapsed time from the initial call for assistance until the first unit arrives are more in line with the public's expectations. Citizens want a rapid response to their request for assistance (Paul, 1995, p. 111).

What Method of Measurement Should Oregon City Use

Once the criteria is selected, the next issue is how the response time information is captured. The response time is often calculated as an average (arithmetic mean) time for all responses. Over a long period of time, given the number of calls a medium or large department receives, circumstances will occasionally arise that will result in very long response times. Average response time data can create a false expectation for the public. A department could be setting itself up for a fall by publishing an average response time and then having to explain an extended response time. Response time data must be clear and concise to avoid confusion from the customer's point of view.

Citizens will understand this information more effectively if a range of response times are presented. (See Table 1.) Using a range, it is easier to demonstrate the normal responses that citizens can expect from their emergency service agency (Brewster, 1994, p.18).

The literature review showed that, for the purposes of planning, it is most effective to calculate response times based on the elapsed time from the first call for assistance until the first unit arrives on scene. There are many methods used to record response times. The method selected should make the information valuable to the organization and be easily understood by the customers they serve. Response time data presents a realistic picture when the goal is to reach a certain percentage of calls in a specified time.

Oregon City Fire Departments Response Times

A review of the Department's records indicated that response times for the past several years have been calculated using an average response time. This method does not provide a measurement that will determine if the Department is meeting its response time goal. Until recently the Department's response time average had been below six minutes. This does not indicate whether the established goal of responding to 90% of all emergencies in less than six minutes is being achieved.

Data from Clackamas Communications Department (C-Com) was collected to provide an accurate measurement of the department's response times for 1998. Currently the department does not have an internal data collection system that provides for reviewing response times over an extended period of time. C-Com was able to provide accurate data on all alarms for 1998.

Other Emergency Service Providers Response Times

The International Association of Fire Chiefs (IAFC) randomly selected 200 fire departments and forwarded a questionnaire to gather response time data. There were 57 departments which responded to the survey from around the world. The IAFC used this data to generate statistical information allowing organizations to compare their response times with those of similar organizations. The study identified the vast differences in the ways fire

departments collect the data. “If we are ever going to measure performance indicators and compare them for an acceptable standard, we will all have to measure the same elements” (Rule, 1992, p. 8). Rule goes on to state in a separate publication “Fire departments should check the various elements of their response time to assure quality control and customer service”(Rule, 1996, p.8).

The literature review of other departments’ response times confirmed what Rule has stated. The various departments use different factors and time frames when establishing their respective response time statistics and goals.

The Phoenix, Arizona Fire Department assumes a 30 second to one minute dispatch time. As Morris suggests in his paper, *A 3 Minute Response Time Goal*, this is a best case scenario (Morris, 1993, p. 2).

“Under city ordinance the Austin Fire Department has an annual average response time goal of 3.5 minutes”(Sybesma, 1995, p.56). This is an example of a department using average response time for a goal, as opposed to the more common goal of reaching a set percentage of emergency calls within an established time frame.

PROCEDURES

The research procedure used to prepare this paper began with a request for a literature search from the Learning Resource Center (LRC) at the National Emergency Training Center (NETC) in September of 1998. A literature review was also conducted at the Oregon City Library in Oregon City, Oregon. Trade journals at the Oregon City Fire Department were also reviewed for material.

The literature review focused on four specific areas. First, a search was made to determine how other emergency response agencies measured their response time. Second, a

determination was made about which method Oregon City should use to measure response times. Third, a review of the response time for the past decade for Oregon City was completed. Finally, a search was conducted to identify response time standards established by other fire departments.

Interviews were conducted with Carol Poulton, Administrative Assistant with the Oregon City Fire Department, on November 13, 1998; Gerald Weise, Information Manager, C-Com, November 17, 1998; Jessica Shriver, Geographic Information Systems, City of Oregon City, November 19, 1998.

C-Com provides all dispatching services for Oregon City Fire Department. They answer 9-1-1 calls and dispatch all units. They provided complete data on all alarms for 1998 including all times for calculating response times. Using the table in the *Executive Development Student Manual*, the size for a random sample of calls to assure a 95% confidence level was selected (Executive Development, 1996, p. 3-39). The Oregon City Fire Department responded to 2,752 calls in 1998. Data for 336 calls was reviewed to determine the department's response times. The data sample consisted of the first 28 priority one calls for each month of 1998. The use of data from each month insured that influences related to weather or time of year were not excluded from the sample data.

Limitations and Assumptions

It was assumed that all data received from C-Com was accurate. There is no secondary source available to confirm the data received concerning the specific response times to emergencies.

There were limitations. No means were available to identify which, if any, responses may have been stepped down from a "priority one" response during the call. This factor could contribute to an increase in the travel time segment of a response.

Another limitation was a lack of historical data available from the Oregon City Fire Department. All previous research had used average times without concern for compliance with response time goals.

Definitions

MEAN	Statistical average of a set of values.
MEDIAN	Value at which half of the values are higher and half are lower; mid point in a list of values.
MODE	Value most frequently observed in a set of values.
PRIORITY ONE	Refers to emergency calls for help. This type of call requires rapid response, using both lights and siren.
RANGE	Lowest and highest values observed in a set of values.

RESULTS

How Should Oregon City Fire Department Calculate Response Times?

Phoenix, Arizona uses a combination of dispatch time, reflex time, and travel time to determine their response time. “This definition is more consistent with the desires of customers, who don’t really care about internal measures; their primary concern is how long it takes for a unit to arrive once a request has been made” (Brewster, 1994, p.18)

The Department’s Strategic Plan states “response times are defined and measured as the elapsed time from the receipt of a call for service at C-Com to the arrival at the scene by the first initial responding fire unit” (Strategic Plan, 1997, p.45). This indicates that Oregon City is using the most accepted method for calculating response times when the data is being used for short and long term planning.

In the past Oregon City has calculated response time as “the travel time of the units only” (C. Poulton, personal communication, November 13, 1998). As previously stated this method

does not address aspects of the response that directly affect the length of the response time. For response times to reflect an accurate picture they must include dispatch, reflex, and travel times.

Is the Oregon City Fire Department Meeting Response Time Goals?

The review of the alarm response data revealed that Oregon City is not meeting its response time goal. The department responded to 73% of all emergencies in less than six minutes, falling short of the goal to reach 90% of all emergencies in less than six minutes.

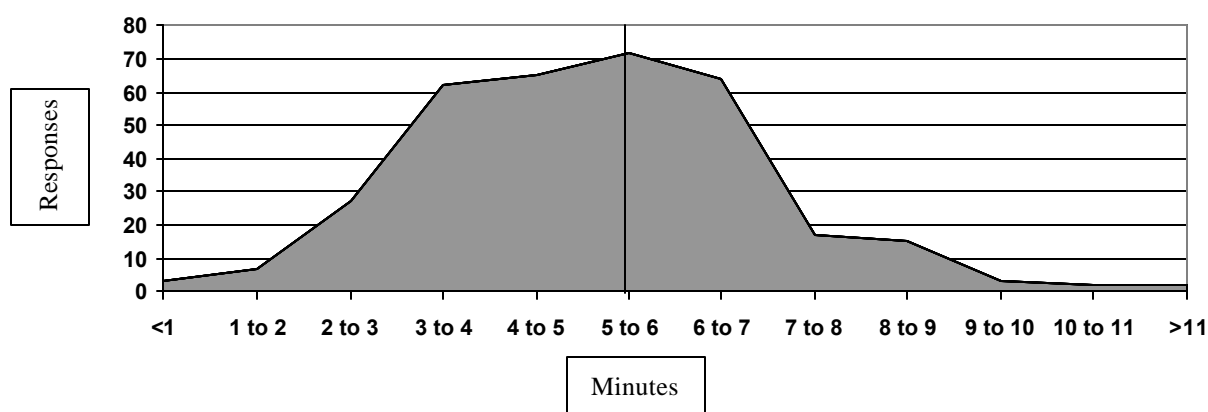


Figure 1. Number of Emergency Responses in One Minute Increments

When response times are displayed in a distribution chart, it can be an effective tool in presenting an accurate picture of response times to customers. (See Figure 1.) A wider range, as seen in Oregon City's case, is typical of emergency responses of a larger jurisdiction with many calls (Brewster, 1994, p.18). This may indicate that Oregon City is experiencing two problems. First, the two existing stations do not provide adequate coverage for the geographic area of the City. Secondly, the number of units available in the City may not be adequate, requiring second and third up units to answer calls when the department experiences simultaneous alarms.

A review of the calls in 1998 that exceeded the response goal confirmed the problems indicated by the wide range of response times in Figure 1. Of the calls which exceeded the response time goals, units other than the first due apparatus responded 18% of the time. Furthermore, 30% of all of the calls that exceeded the response goal occurred in either the Holcomb, or South End neighborhoods. These are two neighborhoods that are experiencing rapid growth and have long travel times from current fire department facilities.

How Do the Oregon City Fire Department's Response Time Goals Compare with those for other Fire Departments?

The literature review located numerous examples of response time goals. No examples were located where an organization had separate goals for fire and medical responses. The Oregon City Fire Department has maintained two goals for planning purposes. The methods that are available to reduce response times to medical calls may be different than those used to improve fire call responses. However; for the purpose of comparison, Oregon City's goal of arriving in less than six minutes to 90% of all emergencies was used.

Based on the world wide response time study that was conducted by the IAFC, a five minute response model was developed. The response goal in the model is to arrive at 90% of all emergencies in less than five minutes. This model includes the total time from the initial notification until the first unit arrives. The time includes twenty seconds for notification, one minute for dispatching, one minute for reflex time, and up to 160 seconds for travel time. (Rule, 1996, p.8)

Rule published the results of the study completed by the IAFC in 1992. That study was based on data gathered from 57 fire departments around the world (Rule, 1992, p.8). The

information collected during this study was compared to Oregon City's response times. (See Table 1.)

	IAFC Study		Oregon City 1998	
	<u>Alarm Processing</u>	<u>Reflex Time</u>	<u>Alarm Processing</u>	<u>Reflex Time</u>
Mean	54 sec.	58 sec.	58 sec.	73 sec.
Median	49 sec.	55 sec.	54 sec.	67 sec.
Mode	60 sec.	45 sec.	59 sec.	59 sec.
Range	21 to 106 sec.	23 to 90 sec.	13 to 137 sec.	5 to 159 sec.

Table 1: Comparison of Oregon City Response Times with IAFC Study Results

The Texas State Board of Insurance, the agency formerly charged with evaluating the effectiveness of Texas fire departments, established response criteria in 1991. The response time includes reflex time and travel time only; no mention was made of the notification time or dispatch time. The established response time for commercial, industrial, and heavy residential (apartments) areas was a maximum of three minutes. For single family residential areas the maximum was 5 minutes (Sybesma, 1995, p.55)

“Under city ordinance the Austin Fire Department has an annual average response time goal of 3.5 minutes from the receipt of the call to the time the first fire unit arrives at the scene of the emergency. Thirty seconds of scramble time is allotted to allow personnel to react to the call, don the appropriate gear, and start the apparatus”(Sybesma, 1995, p.56). This city ordinance does not include any time for the dispatching process.

The Phoenix, Arizona Fire Department has established a three minute response time goal for all emergencies. Their response time is calculated using only reflex time and travel time. There is an assumed alarm initiation and dispatch time of two minutes. The goal is to have a unit on scene in less than five minutes from the initial report. “In reality, the current average response time for the Phoenix Fire Department has been nearly four minutes” (Morris, 1993, p.3).

DISCUSSION

The use of response time to establish an organization’s goals and objectives is prevalent in today’s “customer service driven” fire departments. The most common concern of the fire service’s customer is the response time of emergency units. The fire service has worked on improving its response times for years. With enhanced 9-1-1 we have tried to educate the public on the need for quick notification. However, a rapid call to a 9-1-1 center is only a portion of the entire response time. “Every second counts, and we should not forget the overall picture when we educate the public, train our personnel and plan our programs and activities” (Paul, 1995, p.114)

Any debate on the service level a fire department provides centers on that department’s response time. “There is an obvious link between the time it takes for an emergency response to be affected, and the outcome of most incidents. When a baby is not breathing, or people are trapped in a burning building time becomes a critical factor” (Cole, 1991, p. 20).

Oregon City has established response time goals but there has been no research done to determine if the Department has, or can, achieve these goals. The Department has kept records for years on the average response time. As the research shows “average response times” do not satisfy the needs of the customer or the parties responsible for department planning. The review

of response times in 1998 showed that the department was arriving on scene in less than six minutes 74% of the time for medical calls and 53% of the time for fire emergencies. This suggests that there is a lot of work to be done to start meeting the Department's response goals.

There is no single method for the calculation of response times. It is clear that the response time must be a total elapsed time, made up of several segments. The customer who calls to request aid is interested in the total response time. If the dispatch and reflex times add up to ten minutes, a one minute travel time will do little to console a customer who has been waiting 11 minutes for assistance. While some jurisdictions continue to set goals based solely on travel time, customers are concerned with the total elapsed response time to their request for assistance. "Emergency response follows a time line that can be broken down into three distinct but related phases: dispatching, reaction, and travel times" (Cole, 1991, p.20).

The review of response times from other organizations revealed that Oregon City's goal of less than 6 minutes may be more practical than other organizations. The goal for the Phoenix Fire Department of a three minute travel time seems to be ideal. As stated by Gary Morris (Morris, 1993, p.3), "In reality the average travel time is four minutes, raising the total response time to around six minutes".

The data received during the IAFC study was converted to several tables. One table used data from only full time staffed departments. This data was used to compare with Oregon City. (See Table 1.) Oregon City's times were slightly slower than the ones published by the IAFC. One factor contributing to slower reflex times is in the way C-Com calculates them. The difference between the IAFC reflex time and that used by C-Com was the inclusion of time that dispatchers use notifying responding units. C-Com starts the clock when the notification process

begins; the IAFC started from the end of the notification process (G. Weise, personal communication, November 17, 1998).

The notification time is included in the IAFC study during the alarm processing category. That factor makes the Oregon City statistics for alarm processing fall farther below those from the international study. This would indicate one area where the organization could look to improve their overall response times is the reduction of the “dispatch” segment of the response time.

The results of the data research and literature research indicate that Oregon City’s response time goals are very realistic when compared with those from other departments around the country. It is a wide spread practice in the fire service to use response times for locating new stations, increasing personnel levels, purchasing apparatus, and improving operational procedures and for good reason. Response times are a clear indicator of how well an emergency service agency is delivering service to its customer. It is a tangible measurement that the users of our services can relate to.

It is extremely important to have our customers’ support in improving response times. Quite often the necessary steps to reduce response times are costly and will require voter approval.

The research has shown that the Oregon City Fire Department has done an excellent job in establishing realistic response time goals. These goals are realistic and attainable. It is critical that response goals include both a time element and a resource element similar to the ones in Oregon City’s strategic plan. A quick response with only one person or by the wrong type of apparatus will not provide the service the customer needs. A rapid response with a fully equipped and properly manned apparatus must be included in response goals. “A prudent

response pattern needs quick response times as well as a sufficient number of firefighters for the immediate attack” (Coleman, 1988, p.120).

RECOMMENDATIONS

The following recommendations stem from the data and literature research conducted for this project.

The fire department must review response times on an annual basis. A procedure should be adopted to collect the data and conduct a formal review of the information. This will provide critical information for both short term and long term planning for the department.

As a part of this review, improvements that could have affected response times should be noted. If improvements can be tracked and their affect on response times documented the information could be very beneficial in future planning sessions.

The department should work closely with C-Com to try and reduce the “dispatch” portion of the response times. The comparison with the data collected by the IAFC showed this to be the one area that is farthest below the times in the study. This is the one segment of the total response time that the fire department has no direct control over.

Fire department personnel should be trained in the importance of a quick response. The “reflex time” is the only segment of the response time that is totally in the control of the organization and its personnel. A project involving line fire fighters may produce ideas to reduce the “reflex” segment of the total response.

The Fire Department should work with the Transportation Department to implement traffic control devices that would reduce “travel time” while decreasing the dangers faced by the public and the fire fighters.

It is strongly recommended that anyone duplicating this type of research work closely with their dispatching organization. C-Com provided a huge amount of data for the research. Without their cooperation this research could not have been completed.

REFERENCES

- Brewster, D. (1994, July/August). Emergency Response Time. *9-1-1 Magazine*, 18-21.
- Cole, D. (1991, March). The Emergency Response Time-line. *9-1-1 Magazine*, 20-22.
- Coleman, R. (1988, March). *Managing Fire Services*, 111 - 120
- Morris, G. (1993, February). A 3 Minute Response Time Goal. Phoenix Fire Department
- Oregon City Fire Department Strategic Plan* (1997), 1-45.
- Paul, G. (1995, July). 9-1-1 Response Time. *APCO Bulletin*, 111-112.
- Rule, C. (1992, September). IAFC Accreditation Committee Surveys Fire Departments, Charts
Response Times. *On Scene*, 7-8.
- Rule, C. (1996, November/December). The Five Minute Response. *Wisconsin Fire Journal*, 8
- Sybesma, P. (1995, October). An Equation for Station Location. *Fire Chief*, 55-65
- National Fire Academy* (1996). Table for Determining Random Sample Size. Executive
Development Student Manual, 3-39.